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EXAMINER	
MYINT, DENNIS Y	

ART UNIT	PAPER NUMBER
2162	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/754,371	KOBAYASHI ET AL.	
	Examiner	Art Unit	
	Dennis Myint	2162	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07/06/2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is responsive to Applicant's Amendment, filed on July 6, 2007.

2. In the Amendment filed on July 6, 2007, no amendments were made. Claims 1-30 are pending in this application. Claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20 are independent claims. **This office action is made final.**

3. In light of the arguments made with respect to rejection of claims 11-13, 16-20, 26, and 28-30 under 35 U.S.C. § 101, rejection of said claims under 35 U.S.C. § 101 is hereby withdrawn.

Response to Arguments

4. The applicant's arguments filed on July 6, 2007have been fully considered but are not persuasive.

Referring to claim 1, Applicant argued that *Applicants submit that (1) the Office Action has improperly fragmented certain features in claim 1 into separate sub-elements, and (2) neither Lubbers nor Chen teach any of these features of claim 1 in their entirety* (Applicant's argument, page 22 first paragraph, that *Applicants submit that certain features in claim 1 should be read in their entirety and not in the piecemeal fashion as suggested by the Office Action* (Applicant's argument, page 22 second paragraph), and that *Applicants submit that when the features recited in claim 1 are considered as a whole, none of the references cited by the Examiner disclose or*

suggest each of the elements of these features (Applicant's argument, page 22 last paragraph).

Examiner respectfully disagrees all of the allegations as argued. Examiner, in his previous office action, gave detail explanation of claimed limitation and pointed out exact locations in the cited prior art. Examiner is entitled to give claim limitations their broadest reasonable interpretation in light of the specification. See MPEP 2111 [R-1] Interpretation of Claims-Broadest Reasonable Interpretation.

During patent examination, the pending claims must be 'given the broadest reasonable interpretation consistent with the specification.' Applicant always has the opportunity to amend the claims during prosecution and broad interpretation by the examiner reduces the possibility that the claim, once issued, will be interpreted more broadly than is justified. In re Prater, 162 USPQ 541,550-51 (CCPA 1969).

In response to Applicant's arguments that that *Applicants submit that (1) the Office Action has improperly fragmented certain features in claim 1 into separate sub-elements, and (2) neither Lubbers nor Chen teach any of these features of claim 1 in their entirety* (Applicant's argument, page 22 first paragraph, that *Applicants submit that certain features in claim 1 should be read in their entirety and not in the piecemeal fashion as suggested by the Office Action* (Applicant's argument, page 22 second paragraph), and that *Applicants submit that when the features recited in claim 1 are considered as a whole, none of the references cited by the Examiner disclose or suggest each of the elements of these features* (Applicant's argument, page 22 last paragraph), it is pointed out that claim 1 (and claims 2-7, 10-17, 20-30) are rejected as

being obvious over the combination of Chan in view of Lubber and further in view of Yamato according to 35 U.S.C. § 103(a). Said references are from the same field of computer software and, as such, are analogous arts.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to combine the apparatus of Chen for NAS with the apparatus of Lubbers for NAS, which comprise a plurality of channel controllers, and the apparatus of of Yamamoto, which additional teaches logical-volume access control, so that the combined apparatus method would comprise a plurality of channel controllers and would perform file-locks, access control, and logical/physical mappings, wherein when the plurality of first channel controllers shares a first logical volume", (1) if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume, control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed, and (2) if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume, control is performed wherein an I/O process is performed for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the logical volume lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output form being performed. One would have been motivated to do in order to provide large capacity, high availability and high reliability storage (Lubbers, Paragraph 0007, i.e.,

Large capacity, high availability, and high reliability storage architectures typically involve complex typologies of physical storage devices and controllers) and in order to *provide a storage system with direct access storage devices that can be shared between a block interface and a file interface* (Yamamoto, Column 1 Lines 65-67). Therefore, rejection of said claims under the said combination of references is proper.

Continuing the argument, Applicant stated that *Applicant submit that Lubbers fails to teach "wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume and the plurality of first channel controllers shares the first logical volume" as recited in claim 1* (Applicant's argument, page 23 second paragraph).

In response, it is pointed out that Chen in view of Lubbers and further in view of Yamamoto teaches said limitation as follows: *"wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (*Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address) and "the plurality of first channel controllers shares the first logical volume" (*Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated)*).

Applicant additionally argued that *Applicants submit that Lubbers also fails to*

teach "a data area of the file is locked with the use of the file lock to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while the first channel controller performs an I/O process for one of the plurality of requests to input/output" if the condition precedent "if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume and the plurality of first channel controllers shares the first logical volume" as recited in claim 1 is satisfied (Applicant's argument page 23 third paragraph).

In response, it is pointed out that Chen in view of Lubbers and further in view of Yamamoto teaches said limitation as follows: *"a data area of the file is locked with the use of the file lock to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while the first channel controller performs an I/O process for one of the plurality of requests to input/output"* (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is apparent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access) *if the condition precedent "if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume and the plurality of first channel controllers shares the first logical volume"*(Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e.,

translation of a request expressed in terms of a logical block address).

Applicant also argued that *Applicants submit that Chen similarly fails to disclose or suggest each of the elements of this feature of claim 1. The Office Action admits that Chen fails to teach "if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume and the plurality of controllers shares the first logical volume" as recited in claim 1* (Applicant's argument, page 23 last paragraph through page 24 first paragraph).

In response, it is pointed out that Chen in view of Lubbers and further in view of Yamamoto teaches said limitation as follows: *"if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume"* (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address) and "the plurality of controllers shares the first logical volume"* (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated)*).

Applicant additionally argued that *the cited section of Chen merely discloses the use of FLAP to permit shared access to files and folders on the file system, and Applicants submit that Chen is silent as to the use of a "file lock table" for controlling access to a file as recited in claim 1* (Applicant's argument, page 24 first paragraph).

In response, Chen in view of Lubbers and further in view of Yamamoto teaches the use of a file lock table for controlling access to a file (Paragraph 0039, i.e., *File Level Access Control Protocol (FLAP)* and *These protocols permit shared access to files and folders on a file system).* In File Level Control Protocol (FLAP), file lock table(s) are included.

Applicant also argued that *Applicant further submit that neither Lubbers nor Chen discloses or suggests each of the elements of the following feature recited in claim 1: wherein if more than one of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume and the plurality of first channel controllers shares the first logical volume, the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while and I/O process if performed for one of the plurality of requests to input/output. Applicants submit that neither Lubbers nor Chen teaches each of the elements of this feature in its entirety* (Applicant's argument, page 24 second paragraph).

In response, it is pointed out that Chen in view of Lubbers and further in view of Yamamoto teaches said feature in its entirety as follows: "*wherein if more than one of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume" (*Lubbers, Paragraph 0128, i.e., *In response to user requests, the storage system automatically maps storage between memory representations and on-disk media, levels data storage across both logical and physical structures, and quantifies storage capacity as well as location patterns) and "the*

*plurality of first channel controllers shares the first logical volume" (*Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated)), "the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while and I/O process if performed for one of the plurality of requests to input/output" (*Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is apparent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access).

Applicant also argued that *However, the cited portions of Lubbers merely disclose that the system may receive a plurality of user requests for storage but does not disclose "more than one of the plurality of channel controllers receiving requests to input/output data in a file of the first logical volume" as recited in claim 1* (Applicant's argument, page 24 last paragraph through page 25 first paragraph).

In response, it is pointed out that Chen in view of Lubbers and further in view of Yamamoto teaches said feature as follows: "*more than one of the plurality of channel controllers receiving requests" (*Chen et al., Figure 3: *Gigabit Ethernet Switch/Route*" 270 and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300;* and Lubbers, Figure 2 and Figure 3; Paragraph 0047,

i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet 303) " to input/output data in a file of the first logical volume"* (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address*).

Applicant also argued that *Chen fails to teach at least "the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while an I/O process is performed for one of the plurality of requests to input/output"* (Applicant's argument, page 25 last paragraph) and that *the cited section of Chen merely discloses the use of DLAP to permit access to data on a storage device at the block level. Applicants submit that Chen is silent as to the use of " a logical volume lock table" for controlling access to a file as recited in claim 1* (Applicant's argument, pager 25 last paragraph through page 26 first paragraph).

In response it is pointed that Chen in view of Lubbers and further in view of Yamamoto teaches said features as follows: "*the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while an I/O process is*

performed for one of the plurality of requests to input/output "((Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is apparent that tables such as a file-lock table or volume-lock table are employed in these protocols); and *" a logical volume lock table" for controlling access to a file" (*Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is apparent that tables such as a file-lock table or volume-lock table or logical volume lock table are employed in these protocols (**Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access**)). Additionally, Yamamoto teaches "a logical-volume lock table" in Column 7 Line 36-60 as "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. *".. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access.*"

Applicant also argued that *but Yamamoto does not disclose or suggest access controls that provide exclusive access to a logical volume, such that provided by the logical volume locking table recited in claim 1* (Applicant's argument, pager 26 third paragraph).

In response, it is pointed out that Chen in view of Lubbers and further in view of Yamamoto teaches said features in Chen (Paragraph 0039) as *Device Level Access Control Protocol (DLAP)* and in the same paragraph as *File Level Access Control Protocol (FLAP)* and *These protocols permit shared access to files and folders on a file*

system). In File Level Control Protocol (FLAP), file lock table(s) are included. Note that it is apparent that tables such as a file-lock table or volume-lock table or logical volume lock table are employed in these protocols (**Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access**). Additionally, Yamamoto teaches "a logical-volume lock table" in Column 7 Line 36-60 as "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. "*.. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access.*"

Referring to claims 4, 6, 10, 11, 14, 16, and 20, Applicant argued that *independent claims 4, 6, 10, 11, 14, 16, and 20 should also be allowable for a similar rationale as claim 1 and others* (Applicant's argument, page 27 first paragraph).

In response, it is pointed out that, as with claim 1, Chen in view of Lubbers and further in view of Yamamoto is obvious over said independent claims and, as such, said independent are not allowable.

Applicant also argued that *dependent claims, 2, 3, and 21, which depend from claims, claims 5 and 22, which depend from claim 4, claims 7 and 23, which depend from claims 6, claims 12, 13, and 26, which depend from claim 11, claims 15 and 27 which depend from claim 14, claims 17 and 28, which depend from claim 16, claim 25 which depends from claim 10, and claim 30 which depends from claim 20, should allowable at least due to their dependence from independent claims 1, 4, 6, 10, 11, 14, 16,and 20 respectively* (Applicant's argument, page 27 first paragraph).

In response, it is pointed out that, since said independent claims are obvious over the combination of Chen in view of Lubbers and further in view of Yamamoto, said dependent claims are not patentable.

Referring claims 8, 9, 18, 19, and 24, Applicant argued that *Applicants submit that independent claims 18 and 24 should be allowable for at least the same rationale as independent claim 1 because independent claims 8 and 24 recite limitations similar to those recited in independent claim 1* (Applicant's argument, page 27 third paragraph).

In response it is pointed out that that, since said independent claims are obvious over the combination of Chen in view of Lubbers and further in view of Yamamoto, said independent claims are not patentable.

Finally, Applicant argued that *claims 9 and 24, which depend from claims 8 and claims 19 and 29 which depend from claim 18 should also be allowable* (Applicant's argument, page 27 last paragraph).

In response it is pointed out that that, since said independent claims are obvious over the combination of Chen in view of Lubbers and further in view of Yamamoto, said dependent claims are not patentable.

In view of the above, the examiner contends that all limitations as recited in the claims have been addressed in this Action. For the above reasons, Examiner believed that rejection of the last Office action was proper.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-7, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 25, 26, 27, 28, 29, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (hereinafter "Chen") (U.S. Patent Application Publication Number 2004/0233910) in view of Lubbers et al., (hereinafter "Lubbers") (U.S. Patent Application Publication Number, 2003/0084241) and further in view of Yamamoto (U.S. Patent Number 6779063).

As per claim 1, As per claim 1, Chen et al. is directed to a method and system for storage device controlling apparatus (Figure 3) "including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed" (Chen et al., Figure 3: *Gigabit Ethernet Switch/Route*" 270 and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*), "the file access processing section receiving requests to input and output data in files as units sent from at least one information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to said requests to input and output data to a storage device" (Chen et al. Paragraph 0039, i.e., *The figures show storage server 240 connected to storage devices 290 and 170, for example, via storage interfaces 260. Storage server 240 supports two types of data storage protocols*), and teaches the limitations:

"a file lock table to be used by the file access processing section of the first controller to perform exclusive control, at a file level, on file accesses received by the file access processing section" (Paragraph 0039, i.e., *File Level Access Control Protocol (FLAP)* and *These protocols permit shared access to files and folders on a file system*);

"a logical-volume lock table to be used by the I/O processor of the first channel controller to perform exclusive control of a file, at a block level, on file accesses received by the file access processing section" (Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and*

folders on a file system). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access);

"a data area of the file is locked with the use of the file lock table to prohibit an I/O process for the others of the plurality of requests to input/output form being performed while the first channel controller performs an I/O process for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access); and

"the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while an I/O process is performed for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system* and). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access).

In the above-disclosures of Chen, the limitations "a logical-volume lock table" is inherently taught.

Chen does not explicitly teach the limitations: "a plurality of first channel controllers each of the first channel controllers being connected to a LAN", and "wherein when the plurality of first channel controllers shares a first logical volume", (1) if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" and "(2) if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume".

Lubbers teaches the limitations:

"a plurality of first channel controllers each of the first channel controllers being connected to a LAN" (Lubbers, Figure 2 and Figure 3; Paragraph 0047, i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet 303.*),

"wherein when the plurality of first channel controllers shares a first logical volume" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*),

(1) "if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely*

identified LUN 102; and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*) and

(2) "if more than one of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0128, i.e., *In response to user requests, the storage system automatically maps storage between memory representations and on-disk media, levels data storage across both logical and physical structures, and quantifies storage capacity as well as location patterns*).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to combine the apparatus of Chen for NAS with the apparatus of Lubbers for NAS, which comprise a plurality of channel controllers, so that the combined apparatus method would comprise a plurality of channel controllers and would perform file-locks, access control, and logical/physical mappings, wherein when the plurality of first channel controllers shares a first logical volume", (1) if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume, control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed, and (2) if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume, control is performed wherein an I/O process is performed for one of the plurality of requests to input/output, during which

data area of the file is locked with the use of the logical volume lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output form being performed. One would have been motivated to do in order to provide large capacity, high availability and high reliability storage (Lubbers, Paragraph 0007, i.e., *Large capacity, high availability, and high reliability storage architectures typically involve complex typologies of physical storage devices and controllers).*

Chen in view of Lubbers implicitly teach "a logical-volume lock table" (Chen in Paragraph 0039 as *Device Level Access Control Protocol (DLAP)* and in the same paragraph as *File Level Access Control Protocol (FLAP)* and *These protocols permit shared access to files and folders on a file system).* In File Level Control Protocol (FLAP), file lock table(s) are included. Note that it is apparent that tables such as a file-lock table or volume-lock table or logical volume lock table are employed in these protocols (**Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access**) but dose not explicitly recite a logical-volume lock table.

On the other hand, Yamamoto teaches the limitations:

"a logical-volume lock table" (Yamamoto, Column 7 Line 36-60, i.e. "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. "*.. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access.*") to be used by the I/O processor of the first channel controllers to perform exclusive control of a file, at a block level, on file

accesses received by the file access procession section" (Yamamoto, Column 6 Line 16-19, i.e. *"Control information for lock/unlock processing is stored in the cache memory 42 for the each of the protocols used the file system interface adapters 28, 30, 32, although other shared memory can be used if available*", and Column 4 Line 29-42, i.e. "*As will be seen, the storage controller 14 employs a logical volume management in order to share the resources of the physical disk units 20 between block system and file system interfaces.....").*

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to combine the apparatus of Chen in view of Lubbers for NAS with the apparatus of Lubbers for NAS, which comprise a plurality of channel controllers, and the apparatus of of Yamamoto, which additional teaches logical-volume access control, so that the combined apparatus method would comprise a plurality of channel controllers and would perform file-locks, access control, and logical/physical mappings, wherein when the plurality of first channel controllers shares a first logical volume", (1) if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume, control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed, and (2) if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume, control is performed wherein an I/O process is performed for one of the plurality

of requests to input/output, during which data area of the file is locked with the use of the logical volume lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output form being performed. One would have been motivated to do in order to provide large capacity, high availability and high reliability storage (Lubbers, Paragraph 0007, i.e., *Large capacity, high availability, and high reliability storage architectures typically involve complex typologies of physical storage devices and controllers)* and in order to *provide a storage system with direct access storage devices that can be shared between a block interface and a file interface* (Yamamoto, Column 1 Lines 65-67).

As per claim 2, Chen teaches the limitation:

"wherein said requests to input and output data are sent in accordance with at least two types of network file system protocols, and if, during said exclusive control which is performed upon accepting one of said requests to input and output data sent in accordance with one of network file system protocols, another said request to input/output data sent in accordance with another network file system protocol is accepted, an effect of said exclusive control is also reflected on the another request to input/output data" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)" and "File Level Access Control Protocol (FLAP) and These protocols permit shared access to files and folders on a file system*).

As per claim 3, Chen teaches the limitation:

"wherein a memory area of said storage device is managed in said first logical volume serving as a unit, the logical volume being logically set on the memory area" (Chen, Figure 8: *Virtual Device, Virtual Disk 1*), and "said I/O processor performs exclusive control of said first logical volume in response to said exclusive control of the file" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)* and *File Level Access Control Protocol (FLAP)*);.

As per claim 4, Chen in view of Lubbers and further in view of Yamamoto is directed to a storage device controlling apparatus including a plurality of first channel controllers, each of the first channel controllers being connected to a LAN (Lubbers, Figure 2 and Figure 3; Paragraph 0047, i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet 303*) and a circuit board on which a file access processing section and an I/O processor are formed (Chen, Figure 3: *Gigabit Ethernet Switch/Router 270* and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e. *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*), "the file access processing section receiving requests to input and output data in files as units sent from an information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to said requests to input and output data to a

storage device" (Chen, Paragraph 0039, i.e., *The figures show storage server 240 connected to storage devices 290 and 170, for example, via storage interfaces 260. Storage server 240 supports two types of data storage protocols*), and teaches the limitations:

"a section receiving from said information processing apparatus a request for information specifying a storage location of a file on a memory area of said storage device, and sending said information to said information processing apparatus" (Chen, *Figure 3: Gigabit Ethernet Switch/Router 270* and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*; and Paragraph 0039, i.e., *that transmits and responds to request for data to be read or written on a block level to storage devices*.....);

"a section receiving a request to read data in blocks as units from said information processing apparatus, in which the request is generated based on said information, and outputting an I/O request corresponding to the request to read data to said storage device (Chen, Paragraph 0039, i.e. .. *that transmits and responds to request for data to be read or written on a block level to storage devices*.....);

"a section sending data read from said storage device to said information processing apparatus" (Chen et al., Figure 3: *Gigabit Ethernet Switch/Router 270* and *Storage Server* 240 combined into *Switch/Server Combination* 300 and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*);

"a file lock table to be used by the file access processing section of the first channel controllers to perform exclusive control, at a file level, on file requests received by the file access performing section: and a logical-volume lock table to be used by the I/O processor of the first channel controllers to perform exclusive control, at a block level, on file requests received by the file access processing section" (Yamamoto, Column 7 Line 36-60, i.e. "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. ".. .. *the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access*; Lubbers, Figure 2 and Figure 3; Paragraph 0047, i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet 303;* and Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)* and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access).

"wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035,

i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*) "and the plurality of first channel controllers shares a first logical volume" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*), "a data area of the file is locked with the use of the file lock table to prohibit an I/O process for the others of the plurality of requests to input/output form being performed while the first channel controller performs an I/O process for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system* ; and Yamamoto, Column 7 Line 36-60, i.e. "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. "*.. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access.*"). Note that it is inherent the disclosure of Chen that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access)

"wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely*

identified LUN 102; and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*) "and the plurality of first channel controllers shares a first logical volume" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*), "the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while an I/O process is performed for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system* and Yamamoto, Column 7 Line 36-60, i.e. "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. *".. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access.*"). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access).

As per claim 5, Chen in view of Lubbers teaches the limitation:

"wherein the first channel controllers include at least one enabled to communicate with the information processing apparatus through a Fiber Channel" (Lubbers, Paragraph 0051, i.e., *fiber channel drive;* and Chen, Figure 1B, *Prior Art*).

Also, official note is taken that the use of fiber channel for communication networks is notoriously well known in the art.

Claim 6 is rejected on the same basis as claim 4.

Claim 7 is rejected on the same basis as claim 5. Claim 5 incorporates all the limitations of claim 4.

Claim 10 is rejected on the same basis as claim 1.

Claim 11 is essentially the same as claim 1 except that it set forth the claimed invention as a method of controlling a storage device controlling apparatus including a plurality of controllers rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 12 is essentially the same as claim 2 except that it set forth the claimed invention as a method of controlling a storage device controlling apparatus including a plurality of controllers rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 13 is essentially the same as claim 3 except that it set forth the claimed invention as a method of controlling a storage device controlling apparatus including a

plurality of controllers rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 14 is essentially the same as claim 4 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 15 is essentially the same as claim 5 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 16 is essentially the same as claim 6 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 17 is essentially the same as claim 7 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 20 is essentially the same as claim 1 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

As per claim 21, Chen in view Lubbers teaches the limitations:

"further comprising a second channel controller connected to a SAN and having an I/O process which processes to input/output that have been received via the SAN" (Chen, Figure 3: *Gigabit Ethernet Switch/Route*" 270 and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*) (Note that in the apparatus of Chen in view of Lubbers, Gigabit Ethernet Switch/Router of Chen would be functioning like the second channel controller and network storage controllers (NSCs)of Lubbers would be functioning like the plurality of first channel controllers);

"wherein when the plurality of first channel controllers and the second controller shares a second logical volume" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system.* Note that in the combined apparatus of Chen and Lubbers, a plurality of first channel controllers would share the logical volume(s) of Lubbers and the plurality of first channel controllers and the second controller would share the logical volumes of

Chen.), (1) "if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*), "control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed" (Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access) ; and (2) "if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume" (Paragraph 0128, i.e., *In response to user requests, the storage system automatically maps storage between memory representations and on-disk media, levels data storage across both logical and physical structures, and quantifies storage capacity as well as location patterns*), "control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed"

(Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access).

Claims 22, 23, and 25 are rejected on the same basis claim 21.

Claim 26 is essentially the same as claim 21 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 27 is essentially the same as claim 21 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 28 is essentially the same as claim 21 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 29 is essentially the same as claim 21 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 30 is essentially the same as claim 21 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

8. Claim 8, 9, 18, 19, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Lubbers, further in view of Yamamoto and further in view of Kurio (U.S. Patent Number 5774640).

As per claim 8, Chen in view of Lubbers and further in view of Yamamoto is directed to a storage device controlling apparatus including a plurality of first channel controllers, each of the first channel controllers being connected to a LAN (Lubbers, Figure 2 and Figure 3; Paragraph 0047, i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet*

303) and a circuit board on which a file access processing section and an I/O processor are formed (Chen, Figure 3: *Gigabit Ethernet Switch/Router 270* and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e. *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*), "the file access processing section receiving requests to input and output data in files as units sent from an information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to said requests to input and output data to a storage device" (Chen, Paragraph 0039, i.e., *The figures show storage server 240 connected to storage devices 290 and 170, for example, via storage interfaces 260. Storage server 240 supports two types of data storage protocols*), and teaches the limitations:

"a section setting at least one of logical volumes logically set on a memory area of said storage device as a shared first logical volume accessible from each of said first channel controllers" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*);

"a file lock table to be used by the file access processing section of the first channel controllers to perform exclusive control, at a file level, on file requests received by the file access performing section: and a logical-volume lock table to be used by the I/O processor of the first channel controllers to perform exclusive control, at a block level, on file requests received by the file access processing section" (Yamamoto, Column 7 Line 36-60, i.e. "*The system administrator may create data structures, for*

example, in the form of the table 120 illustrated in FIG. 5." and Column 8 Line 35-64, i.e. "*.. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access*; Lubbers, Figure 2 and Figure 3; Paragraph 0047, i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet 303;* and Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)* and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access);

"wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*) "and the plurality of first channel controllers shares a first logical volume" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*), "a data area of the file is

locked with the use of the file lock table to prohibit an I/O process for the others of the plurality of requests to input/output form being performed while the first channel controller performs an I/O process for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system* ; and Yamamoto, Column 7 Line 36-60, i.e. "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. "*.. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access.*"). Note that it is inherent the disclosure of Chen that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access)

"wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*) "and the plurality of first channel controllers shares a first logical volume" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*), "the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the

others of the plurality of requests to input/output from being performed while an I/O process is performed for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system* and Yamamoto, Column 7 Line 36-60, i.e. "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. "*.. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access.*"). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access).

Chen in view of Lubbers and further in view of Yamamoto does not explicitly teach the limitation:

"a section performing fail-over based on take-over information of each of said channel controllers, in which the take-over information is stored in said shared first logical volume and used when one of said channel controllers takes over processing of another one of said first channel controllers".

Kurio teaches the limitation:

"a section performing fail-over based on take-over information of each of said channel controllers, in which the take-over information is stored in said shared first logical volume and used when one of said channel controllers takes over processing of another one of said first channel controllers" (Kurio, Column 8 Line 14-34). Kurio

teaches a method and system for a fault tolerant network interface controller, wherein up to four Ethernet controllers (more than one alternate controller) are used (Kurio, Column 8 Line 14-15). Kurio additionally discloses that, when the primary Ethernet controller fails, the process failover to the alternate Ethernet controller (Kurio, Column 8 Line 14-34). Second failover means, when said different interface controller fails, transfers processing of said different interface controller to normal interface controller include among said first interface controllers. It is well know in that that takeover mechanism or any other mechanism could be stored in any type of memory, including shared logical volumes.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to combine device of Chen in view of Lubbers and further in view of Yamamoto with the feature of responding to failovers as taught by Kurio, so that the combined device would constitute a storage device controlling apparatus including a plurality of first channel controllers each of the first channel controllers being connected to a LAN and having a circuit board" (Lubbers, Figure 2 and Figure 3; Paragraph 0047, i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet 303*), "on which a file access processing section and an I/O processor are formed" (Chen, Figure 3: *Gigabit Ethernet Switch/Router* 270 and *Storage Server 240* combined into *Switch/Server Combination* 300 and Paragraph

0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*), "the file access processing section receiving requests to input and output data in files as units sent from an information processing apparatus via a network, the I.O processor outputting I/O requests corresponding to said requests to input and output data to a storage device (Chen et al. Paragraph 0039, i.e. "The figures show storage server 240 connected to storage devices 290 and 170, for example, via storage interfaces 260. Storage server 240 supports two types of data storage protocols."), said apparatus comprising:

"a section setting at least one of logical volumes logically set on a memory area of said storage device as a shared first logical volume accessible from each of said channel Controllers (Chen , Figure 8: *Virtual Device*, *Virtual Disk 1* and Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)* and *File Level Access Control Protocol (FLAP)*; and Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*);

"a section performing fail-over based on take-over information of each of said first channel controllers, in which the take-over information is stored in said first shared logical volume and used when one of said channel controllers takes over processing of another one of said first channel controllers (Kurio, Column 8 Line 14-34) (It is well know in that that takeover mechanism or any other mechanism could be stored in any type of memory, including shared logical volumes.);

"a file lock table to be used by the first access processing section of the first channel controllers to perform exclusive control, at a file level, on file requests received by the file access processing section" (Chen et al., Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)* and *File Level Access Control Protocol (FLAP)*);

"a logical-volume lock table to be used by the I/O processor of the first channel controllers to perform exclusive control, at a block level, on file requests received by the file access processing section" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)* and *These protocols permit shared access to files and folders on a file system*");

"wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume and the plurality of first channel controllers shares a first logical volume, a data area of the file is locked with the use of the file lock table to prohibit an I/O process for the others of the plurality of requests to input/output form being performed while the first channel controller performs an I/O process for one of the plurality of requests to input/output" and

"wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume and the plurality of first channel controllers shares a first logical volume, the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while an I/O process is performed for one of the plurality of requests to input/output.

One would have been motivated to do so in order to *provide a fault-tolerant network interface* (Kurio, Column 2 Lines 32-36).

Referring to claim 9, Kurio teaches the limitation:

"wherein said fail-over is performed in any one of cases where a request to perform said fail-over is received from said information processing apparatus and where a fault occurs in said another channel controller" (Kurio, Column 8 Line 14-34).

Claim 18 is essentially the same as claim 8 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 19 is essentially the same as claim 9 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

As per claim 24, Chen in view Lubbers, in view of Yamamoto and further in view of Kurio teaches the limitations:

"further comprising a second channel controller connected to a SAN and having an I/O process which processes to input/output that have been received via the SAN"

(Chen, Figure 3: *Gigabit Ethernet Switch/Route*" 270 and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*) (Note that in the apparatus of Chen in view of Lubbers, Gigabit Ethernet Switch/Router of Chen would be functioning like the second channel controller and network storage controllers (NSCs)of Lubbers would be functioning like the plurality of first channel controllers);

"wherein when the plurality of first channel controllers and the second controller shares a second logical volume" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system.* Note that in the combined apparatus of Chen and Lubbers, a plurality of first channel controllers would share the logical volume(s) of Lubbers and the plurality of first channel controllers and the second controller would share the logical volumes of Chen.), (1) "if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*), "control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from

being performed" (Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access) ; and (2) "if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume" (Paragraph 0128, i.e., *In response to user requests, the storage system automatically maps storage between memory representations and on-disk media, levels data storage across both logical and physical structures, and quantifies storage capacity as well as location patterns*), "control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed" (Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access).

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Myint whose telephone number is (571) 272-5629. The examiner can normally be reached on 8:30AM-5:30PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Breene can be reached on (571) 272-4107. The fax phone number for the organization where this application or proceeding is assigned is 571-273-5629.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Examiner
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